

Vermont.—22d.

Virginia.—6th, 19th, 20th, 21st, 23d to 26th.

Washington Territory.—23d.

West Virginia.—21st.

Wisconsin.—20th, 21st, 26th, 27th, 28th.

Wyoming.—19th.

The phases of the moon during May, 1885, were: last quarter, 7th, 3.37 a. m.; new moon, 14th, 10.11 a. m.; first quarter, 21st, 12.39 a. m.; full moon, 28th, 3.25 p. m.; apogee, 4th, 5.18 a. m., and 31st, 6.54 p. m.; perigee, 16th, 4.54 a. m.

MIRAGE.

Mirage was observed at the following stations during the month:

Webster, Dakota, from 2d to 5th, 9th to 14th, 17th to 21st, 25th, 27th, and 30th.

Tucson, Arizona, 8th.

Harvard, Nebraska, 18th.

Manistique, Michigan, 19th, 25th.

Grand Haven, Michigan, 27th.

MISCELLANEOUS PHENOMENA.

SUNSETS.

The characteristics of the sky, as indicative of fair or foul weather for the succeeding twenty-four hours, have been observed at all Signal Service stations. Reports from one hundred and sixty stations show 5,046 observations to have been made, of which thirteen were reported doubtful; of the remainder, 5,033, there were 4,284, or 85.1 per cent., followed by the expected weather.

SUN SPOTS.

Professor David P. Todd, director of the Lawrence Observatory, Amherst, Massachusetts, furnishes the following record of sun spots for May, 1885:

Date— May, 1885.	No. of new		Disappeared by solar rotation.		Reappeared by solar rotation.		Total No. visible.		Remarks.
	Gr'ps	Spots	Gr'ps	Spots	Gr'ps	Spots	Gr'ps	Spots	
2, 5 p. m...	0	20†					7	70†	Broad areas of facule. Do.
3, 5 p. m...	1	20†	2	5	1	3	6	85†	
9, 11 a. m...							9	90†	Broad areas of facule.
10, 11 a. m...	0	0	4	10†	0	0	6	65†	
11, 6 p. m...	1	5	0	10†	0	0	7	60†	
12, 12 m...	0	0	3	10†	0	0	4	50†	
15, 12 m...	1	3†			1	3	3	10	Two of the spots very large—one with bright nucleus in umbra.
16, 11 a. m...	1	5†	0	3			4	25†	
19, 10 a. m...							5	65†	
5 p. m...	1	10†	0	0	1	2	6	75†	Three spots quite large. Do. Do.
21, 9 a. m...	1	2	0	0	0	0	7	75†	
12 m...	0	0	0	0	0	0	7	75†	
4 p. m...	0	10†	0	0	0	0	7	85†	
22, 4 p. m...	0	30†	0	0	0	0	7	115†	Broad areas of facule.
24, 11 a. m...	1	2	0	0	1	2	8	100†	
25, 4 p. m...	0	50†	0	0	0	0	8	160†	
26, 6 p. m...	1	5	1	5	0	0	8	150†	
28, 10 a. m...	2	5†			2	5†	8	85†	Broad areas of facule.
29, 4 p. m...	1	5†	0	15†	0	0	9	50†	

Facule were seen at the time of every observation. †Approximated.

Prof. L. G. Carpenter, of the Michigan State Agricultural College, Lansing, reports sun spots during May, as follows:

1st, 7 p. m., seven groups, thirty-eight spots; 2d, 11 a. m., six groups, forty-five spots; 4th, 3.20 p. m., five groups, thirty spots; 11th, 3.45 p. m., six groups, twenty-five spots; 12th, — p. m., five groups, thirty-three spots; 16th, 3.30 p. m., three groups, twenty-seven spots; 18th, 3.45 p. m., four groups, twenty-three spots; 28th, — p. m., seven groups, thirty-nine spots.

The Chief Signal Officer has received from Mr. Frank Rede Fowke, Secretary to the Solar Physics Committee, Science and Art Department, London, S. W., a tabulated statement of the "dates of coincidence of the assumed prime meridian of the sun with the central meridian of the visible hemisphere," covering the period from 1873 to 1885, both inclusive. The fol-

lowing relating to the year 1885, is from the table above referred to:

Month.	Date.	Greenwich mean solar time.	Day of year and decimal of day.	Month.	Date.	Greenwich mean solar time.	Day of year and decimal of day.
January...	26	h. m.	25.61	July	9	h. m.	189.17
February...	22	22 43	52.95	August	5	9 22	216.39
March	22	0 14	80.25	September	1	15 7	243.63
April	18	12 53	107.54	September	28	21 36	270.90
May	15	18 29	134.77	October	26	4 48	298.20
June	11	23 17	161.97	November	22	12 14	325.51
				December	19	19 55	352.83

The day of the year and the decimals of a day are reckoned from Greenwich mean noon of January 1st.

The assumed prime meridian is that which coincided with the ascending node of the sun's equator at the epoch 1854.0.

The assumed period of rotation is 25.38 mean solar days.

DROUGHT.

Bangor, Maine: on the 31st there was a heavy rainfall; previous to that date the crops were in need of rain.

Sanford, Florida: the rains on the 19th ended a drought which had prevailed in this vicinity for six weeks.

Cedar Keys, Florida: drought prevailed in this region during the month until the 21st, when 1.05 inches of rain fell. The drought had prevailed for two months and as a result, the water supply was very limited and crops suffered seriously.

Milwaukee, Wisconsin: up to the 29th, barley, oats and wheat were suffering in consequence of drought. The monthly rainfall was the least that has fallen in May during the last fourteen years.

Spokane Falls, Washington Territory: the rain on the 13th was of great benefit to the crops, which were suffering from drought.

Red Bluff, California, 31st: stockmen report that in the mountain regions the present season has been the driest known for many years, and that stock has suffered in consequence of poor pasturage and scarcity of water.

Beloit, Rock county, Wisconsin: the month of May was unusually dry in this region.

Sussex, Waukesha county, Wisconsin, 31st: the grain and grass crops suffered seriously from drought during the month, which was the driest known for ten years.

EARTHQUAKES.

Winnemucca, Nevada, 1st: a slight shock of earthquake occurred at 9.30 p. m., local time (12.21 a. m., 75th meridian). It was noticed by many persons in the central and lower portions of the town, while it was not perceptible east of the railroad. It is reported to have caused swinging lamps to vibrate, crockery and windows to rattle, etc. Persons out of doors did not feel the shock, but some report having heard a rumbling noise, which was supposed to have been due to the earthquake.

The following is taken from "Nature," of May 7, 1885:

At half-past 1 o'clock, on the morning of the 1st instant, two or three rather violent shocks of earthquake were felt at Vienna, Austria, accompanied by a rolling noise, and causing a great clattering of furniture.

Shocks of far greater violence were experienced in Styria, where many houses were damaged and some persons killed. In the western districts the shocks were of a light character. The phenomenon appears to have extended southward as far as Grätz and westward to Bavaria. A shock was also felt at Monte Carlo, at ten minutes to 3, on the morning of the 2d instant. The shock was strongest in the districts of Condammone and the Cap d'Aile.

Olympia, Washington Territory, 3d: a light earthquake shock occurred at 11.30 p. m. (local time). Light shocks continued until 1.30 a. m., of the 4th.

The following is taken from "Nature" of May 28, 1885:

Shocks of earthquake were felt at Wartherg and Kindberg, Austria, on May 20, toward 1.30 a. m.

A sharp shock was felt at Smyrna, Turkey, at 7.15 p. m., on May 26.

The "New York Journal of Commerce," of June 3, 1885, contained the following:

London, June 2.—A dispatch from Serinagur, India, says that city was visited by a frightful earthquake on Sunday last (May 31st). The shocks, which occurred at intervals of ten minutes, were of great violence. The greater part of the city was destroyed and the cavalry barracks is a mass of ruins. Fifty persons are known to have been killed and hundreds of the injured have already been taken from the general wreck. The total loss of life or the number of the maimed must remain unknown for some days, as many of the inhabitants still lie buried in the ruins. When the shocks were first felt and the people realized that they were being subjected to the awful possibilities of an earthquake the wildest panic seized them. Every one able to do so rushed from the tumbling houses and fled to the boats on the river and on the lakes, or sought the open country. The terrified inhabitants are now camped in the fields that surround the town.

Serinagur is near the centre of the vale of Cashmere, and that whole territory experienced the terrible earthquake shocks. The damage caused throughout the vale is enormous. The loss in cattle alone is very great. The affrighted people seem to be utterly helpless, and succor is being sent them as rapidly as the Indian authorities can organize relief. Many of the houses yet standing show large rents in the walls and must be razed to the ground. The shocks have not yet ceased, and this fact greatly retards the work of rescuing the people pinned down in the debris, and it is feared many of these must perish before they can be reached by the relief parties.

FOREST AND PRAIRIE FIRES.

Baltimore, Maryland, 2d: a fire broke out in the woods near Back river, about ten miles east of this city, burning over an area about two miles in length. A quantity of fencing was destroyed.

Bethlehem, Pennsylvania, 5th: an extensive forest fire has prevailed along the Blue mountains in Northampton county. The area burned was covered with valuable timber.

Annapolis, Maryland, 8th: much valuable timber, cord wood, and fencing have been destroyed by forest fires on the north Severn river.

Lynchburg, Virginia, 10th: reports from various points in the counties along the Blue Ridge mountains state that the forest fires during the last two weeks have destroyed several dwellings with other property.

East Saginaw, Michigan, 16th: reports from Harrison state that nearly a million feet of pine logs in that vicinity have been destroyed by forest fires; the loss is estimated at \$10,000.

Marquette, Michigan, 16th: forest fires have caused considerable damage along the Detroit and Milwaukee railroad, between this place and Saint Ignace. Five buildings at Newberry were burned.

Milwaukee, Wisconsin, 16th: reports from various towns to the west and northwest, within fifty miles of this place, state that many settlements have been endangered by forest fires, and that many homes have been abandoned.

Manistee, Manistee county, Michigan: property valued at \$25,000 was burned in this vicinity on the 16th.

Ludington, Mason county, Michigan: extensive forest fires prevailed along the line of the Flint and Pere Marquette railroad on the 16th. The village of Tallman, in this county, was endangered, and the roads between that place and Manistee were rendered impassable.

Green Bay, Brown county, Wisconsin: on the 16th, forest fires prevailed to the west and northwest of this place in Brown, Oconto and Shawano counties, destroying much fencing and endangering the villages.

Edmore, Montcalm county, Michigan, 18th: Graffville, a small lumber town in this county, has been destroyed by forest fires, entailing a loss of about \$40,000. At Stanton, also in this county, fifty-two houses were destroyed, involving a loss of \$25,000.

Riverhead, Long Island, 18th: forest fires in Suffolk county have caused damage estimated at \$60,000.

Middletown, Frederick county, Maryland: an extensive fire prevailed on South mountain, north of this place on the 19th.

Wilkesbarre, Pennsylvania: on the 19th extensive fires prevailed at Harvey's lake, twelve miles from this place; much valuable timber was destroyed.

Quebec, Province of Quebec: during the 21st and 22d the

sun was obscured by smoke from fires which prevailed in the mountains to the north and northwest of this place.

Easton, Pennsylvania, 22d: the fires on Blue mountain in Northampton county, which were partly subdued two weeks ago, have broken out afresh. In Monroe county a considerable area has been burned over.

Williamsport, Pennsylvania, 23d: destructive forest fires have prevailed in Sugar valley and in the White Deer mountains during the past week. An area of twenty-five square miles has been burned over, destroying about \$1,000,000 worth of property.

East Tawas, Iosco county, Michigan: on the 25th extensive forest fires were burning to the north and west of this place, destroying a large quantity of pine timber.

Mount Washington, New Hampshire: on the 16th the valleys to the west of station were almost obscured by smoke from forest fires. On the 17th, extensive fires prevailed in the valleys to the westward. These fires continued until the 23d.

Prairie and forest fires were also reported from the following places:

Humphrey, New York, 18th.

Escanaba, Michigan, 14th, 15th, 16th.

Grand Haven, Michigan, 16th, 17th.

Saint Vincent, Minnesota, 11th to 14th.

Fort Buford, Dakota, 9th.

Burlington, Iowa, 15th.

Yankton, Dakota, 1st, 2d, 3d, 5th, 9th, 10th, 13th.

North Platte, Nebraska, 13th.

Harvard, Nebraska, 30th.

INSECTS.

Bethel, Connecticut, 13th: the canker worm has caused some damage to orchards in this (Fairfield) county.

The San Francisco "Chronicle," of May 15th, reports that grass-hoppers have caused great damage throughout a large part of the foot-hill region of California. They have appeared in Placer, Yuba, Nevada, Amador, Napa, Sonoma, San Joaquin, Butte, Sacramento, El Dorado, Tehama, and Merced counties. The grainfields and orchards in many of these counties have been entirely ruined.

Nashville, Tennessee, 17th: reports from various parts of the state show that the "cut-worm" has caused great damage to crops. About the 28th potato bugs began to appear, and were very destructive. In some instances entire fields were destroyed in from two to three days.

Washington, District of Columbia: the seventeen-year locusts were first observed here on the 24th.

Salt Lake City, Utah: caterpillars appeared about the 20th, and caused much injury to trees.

Vevay, Switzerland county, Indiana: large numbers of insects of various kinds made their appearance about the 20th, and during the remainder of the month were very destructive to vegetation.

Anna, Union county, Illinois: the seventeen-year locusts began to make their appearance in large numbers on the 25th, causing damage to vegetables and early fruit in the lowlands.

Fort Myer, Virginia: large numbers of seventeen-year locusts made their appearance about the 26th. For several days previous to that date they were unearthed quite numerous by workmen engaged in grading at this place; they were first found at a depth of nine inches below the surface of the ground.

Denver, Colorado, 27th: reports from the south side of the Arkansas river above Pueblo, state that great numbers of grasshoppers have appeared in that region and have devoured early vegetables and shrubbery.

Little Rock, Arkansas, 28th: reports from Craighead, Crittenden and other counties in northwestern Arkansas state that locusts in vast numbers have suddenly appeared in that region, and have caused much damage to wheat. Locusts first appeared in the vicinity of Little Rock, on the 30th.

Reports from East and West Carroll parishes in Louisiana,

state that locusts and cotton worms have also appeared in those localities.

The Signal Service observer at Red Bluff, California, reports that during the month grasshoppers caused injury to vines, young trees and grain fields in that vicinity. In some instances the fields of grain were so badly damaged as to be not worth harvesting.

Emmitsburg, Maryland: locusts made their appearance in this locality on the 31st.

Lead Hill, Boone county, Arkansas, 31st: during the middle and latter portions of the month "cut worms" appeared in large numbers and were very destructive to gardens.

METEORS.

Wytheville, Virginia: at 7.52 p. m. on the 6th, a meteor of a pale yellow color was observed moving slowly in a course nearly parallel to the horizon. Its flight was from five to seven seconds duration.

Woodstock, Vermont: at about 9 p. m. on the 16th a large and brilliant meteor was observed. It passed from the southwestern sky to within 30° or 40° of the northeastern horizon producing a very bright light during its passage.

Lamar, Missouri: a brilliant meteor was seen moving from southeast to northwest at 4 a. m. on the 23d. Before disappearing, it exploded into many parts; it left a brilliant train.

Meteors were also observed at the following places on the dates set opposite:

Lead Hill, Arkansas, 1st.
Fort Scott, Kansas, 1st.
Woodstock, Maryland, 2d.
Variety Mills; Virginia, 2d.
Emmitsburg; Maryland, 7th, 14th, 18th.
Cincinnati, Ohio, 8th.
Webster, Dakota, 9th, 11th.
Prescott, Arizona, 12th.
Limona, Florida, 12th.
Genoa, Nebraska, 14th.
Pittsburg, Pennsylvania, 14th.
Marion, Virginia, 14th.
Charleston, Illinois, 15th.
Sherlock, Kansas, 20th.
Baltimore, Maryland, 20th.
San Antonio, Texas, 21st.
Dale Enterprise, Virginia, 23d.

MIGRATION OF BIRDS.

Geese flying northward.—Fort Yates, Dakota, 9th; Mooretown, Michigan, 12th; Mount Washington, New Hampshire, 6th; Stateburg, South Carolina, 11th; Tatoosh Island, Washington Territory, 23d, 24th; Manistique, Michigan, 3d, 4th.

Geese flying southward.—Yuma, Arizona, 2d; Eastport, Maine, 30th; Saint Vincent, Minnesota, 8th.

Cranes flying northward.—Embarras, Wisconsin, 11th.

Ducks flying northward.—Tatoosh Island, Washington Territory, 20th, 21st, 23d, 24th, 25th.

POLAR BANDS.

Archer, Florida, 2d, 4th, 7th, 11th.
Limonia, Florida, 7th, 10th.
Guttenberg, Iowa, 1st.
Yates Centre, Kansas, 10th.
Maud, Kansas, 4th, 6th, 8th, 12th, 23d.
Gardiner, Maine, 29th.
Escanaba, Michigan, 21st, 27th.
Mountaineville, New York, 27th.
Wauseon, Ohio, 11th, 16th.
Nashville, Tennessee, 5th, 8th.
El Paso, Texas, 24th, 25th.
Wytheville, Virginia, 2d.

SAND STORMS.

Fort Thomas, Arizona, 4th.

Willcox, Arizona, 12th.
Yuma, Arizona, 14th, 15th.
Fort Yates, Dakota, 8th, 13th, 22d.

WATER-SPOUTS.

Schooner "Annie R. Lewis," L. L. Lewis, master, May 3d, at 6.45 a. m., in N. 23° 28', W. 80° 39', saw a water-spout; same day, at 5 p. m., in N. 25° 8', W. 80° 5', saw another.

Bark "Nordcap," E. Salvesen, master, on May 6th, near N. 40° 50', W. 41° 00', saw a water-spout.

Schooner "Annie R. Lewis," L. L. Lewis, master, on May 9th, 2.30 p. m., in N. 36° 28', W. 73° 30', during a heavy squall, saw several water-spouts, one of which passed over the schooner, but did no damage as it broke a short distance to windward of the vessel. The whirlwind accompanying it was terrific, lasting a few seconds.

S. S. "Edith Godden," J. H. Bennett, commanding, May 10th, 6.59 a. m., in N. 23° 0', W. 74° 29', saw a waterspout.

The following is from "Science," June 5, 1885:

Captain Sawyer, of the bark "Vidette," reports that on May 17th, 1885, a water-spout appeared to form and rise in the northeast in a long spiral column; position at time—latitude 32° 10' north, longitude 78° 5' west. It rose until the sky above, extending over an area of a mile, was an inky black mass of heavy clouds, gradually moving in a southwest direction until within half a mile of the vessel, when it seemed to burst, the rain coming down in torrents for two hours. This was accompanied by sudden, strong gusts of wind, shifting suddenly from one quarter to directly the opposite one, and with a force of six to eight. To the south and southwest before and during the formation of the water-spout, the sky, to an altitude of about sixty degrees, was black and very threatening, with thunder and lightning. This continued during the time alluded to, and finally ended with several sharp claps of thunder and a fifteen minutes' fall of hailstones. The peculiarity of these disturbances was that the wind would change very suddenly with considerable force, throwing all aback without any warning. The temperature of the water was 81° and of the air 60° to 78°.

S. S. "Edith Godden," J. H. Bennett, commanding, on the 18th, at 5 p. m., passed a water-spout in N. 30° 10', W. 74° 38'.

Sanford, Florida, 23d: at 11.35 a. m., during a thunderstorm and heavy wind squall over Lake Monroe, a water-spout formed on the northern side of the lake. It was composed of a vaporous, funnel-shaped cloud, extending downward until it was joined by a similarly shaped body of water rising from the lake. It moved in an easterly direction for about half a mile and then disappeared, having remained visible for eight minutes. The water-spout was accompanied by a roaring sound.

ERRATA.

In the January REVIEW, page 19, in the table of miscellaneous data, the departure from the normal pressure at Fort Concho, Texas, —.05, should read +.05.

In the March REVIEW, page 66, under "deviations from average precipitation," Milledgeville, Georgia, monthly precipitation, 3.32, is 5.55 below the March average, should read 5.55 below that for March, 1884, and 2.00 below the March average.

NOTES AND EXTRACTS.

The following extract is from the May, 1885, report of the "Alabama Weather Service," under direction of Prof. P. H. Mell, jr., Auburn:

The temperature for the month has varied but little from that of May last year.

The rainfall has been in excess of the normal one or two inches. The close of the month was characterized by almost constant rains, and in some of the large streams floods were seriously apprehended. The first few days being dry and mild, the farmers were able to clean out their crops and place them in a favorable condition for the growing rains that closed May. The excessive rains from the 19th to the 31st slightly injured the cotton plant, but this unfavorable result was counterbalanced by the rapid and vigorous growth given to the small grains. The peculiar condition of the weather during the first part of the month brought out numerous cut-worms in all sections of the state, which did much damage to field and garden crops; the humid condition of the atmosphere, however, during the last days, enabled the plants to outgrow this attack, and the close of the month finds the farmers and truck gardeners generally in good spirits.

The average temperature, 60° 7, for the spring just closed, is from one to four degrees below the average. The coldest days were March 23d, April 4th,

and May 11th. The warmest days were March 28th and 31st, April 25th and 30th, and May 25th to 30th.

The average precipitation, 13.17, for the spring, is from one to three inches below the average.

State summary.

Mean temperature, 69°.7; highest temperature, 96°, at Livingston on the 30th; lowest temperature, 34°, at Gadsden on the 11th. Range of temperature, 62°; greatest monthly range of temperature, 58°, at Calera; least monthly range of temperature, 24°, at Wetumpka; mean daily range, 16°.3; greatest daily range of temperature, 44°, at Selma on the 16th; least daily range of temperature, 0°, at Fayette on the 27th and at Livingston on the 19th.

Mean depth of rainfall, 6.21 inches; mean daily rainfall, 0.20; greatest depth of monthly rainfall, 12.96 inches, at Bolling; least depth of monthly rainfall, 2.27 inches, at Clintonville; greatest daily rainfall, average for state, 0.87 of an inch, on the 27th; greatest daily local rainfall, 5.30 inches, at Pine Apple, on the 30th; days of general rainfall, 6th, 12th, 19th, 21st, 22d, 23d, 26th, 27th, 28th, 29th, 30th.

Average number of days on which rain fell, 11; average number of cloudy days, 13; average number of fair days, 11; average number of clear days, 7; warmest days, 24th, 25th, 28th, 29th; coldest days, 10th and 11th.

Prevailing direction of wind, southwest.

The following is an extract from the May, 1885, report of the "Georgia Weather Service," under direction of Hon. J. T. Henderson, Commissioner of Agriculture:

The mean temperature of the month of May has been four degrees below the general average temperature for this month as deduced from meteorological observations of ten years, while the rainfall has been nearly twice the usual amount, approaching closely to the average for the month of April.

The number of rainy days in the different sections has varied from five to twenty-three, the greatest number occurring in north Georgia, while the heaviest precipitation and largest total rainfall, contrary to what is usual at this season of the year, has occurred in the more southerly portions of the state.

The low temperature has retarded the growth of plants and furthered the destructive work of the cut-worm, of which there has been much general complaint. But the weather conditions have been by no means as unfavorable to most crops as those of the preceding month.

The following meteorological summary and accompanying remarks are from the May, 1885, report of the "Indiana Weather Service," under direction of Prof. H. A. Huston, of Purdue University, Lafayette:

Districts.	Temperature.			Precipitation.
	Highest.	Lowest.	Monthly mean.	
Northern counties.....	89	29.5	58.4	4.59
Central counties.....	87.7	24	60.1	3.14
Southern counties.....	87	35	62.6	3.71
State.....	89	24	60.4	3.81

The mean temperature of the state for May, 60°.39, was 1°.19 below that for last year; 3°.61 below the mean of fourteen years at Indianapolis; 1°.34 above the mean of nine years at Wabash; 3°.58 below the mean of twenty-six years at Logansport, 0°.91 below the mean of thirty-one years at Spiceland, 5°.01 below the mean of twenty-one years at Vevay, 1°.17 below the mean of six years at this station, and about 3°.50 below the normal.

The mean precipitation for the State for May, 3.81 inches, was 0.20 inch below that for last year; 0.63 below the mean of fourteen years at Indianapolis; 0.46 below the mean of nine years at Wabash; 0.10 below the mean of three years at Worthington; 0.41 below the mean of twenty-six years at Logansport, 0.22 above the mean of twenty-six years at Spiceland, 0.28 above the mean of twenty-one years at Vevay, 0.87 below the mean of six years at this station, and about 0.50 inch below the normal.

The season has been from one to three weeks late. Locusts appeared in the southern counties during the last week of May, and in the central counties during the first week of June.

A severe thunder-storm accompanied by high wind and hail occurred at Spiceland on the 24th. Precipitation, 1 inch; thermometer fell 27°. On the evening of the 22d a very heavy rainfall occurred at Brookville. Three inches of rain fell in three hours, the railroad tracks were washed out, the canal bank broken and much other damage done. The heavy rainfall seems to have been the result of the union of two storms, one from the southwest and the other from the northeast. The storm passed to the eastward after the union.

The frost of the 10th did some damage to crops at Knightstown.

The following is the May bulletin of the "Iowa Weather Service," under the direction of Dr. Gustavus Hinrichs, Iowa City:

May, 1885, was cool and windy, westerly winds prevailing.

The mean temperature of the air was one and a half degrees below normal. Since 1860, May has been five times much colder, namely in 1883, 1882, 1878, 1873, and 1867. Generally, once in three years, May is as cold, or colder, as it was this year.

The first decade was remarkably cold, being seven degrees below normal; on the 7th, a slight snow fell in northern Iowa, and ice had formed on standing water. This cold continued till the 9th. The second decade was only one and a half degrees below the normal, and the 18th was its coldest day. The third decade was decidedly warm, being three degrees above normal, and the temperature running up above 80° on the 22d and 23d.

The number of days with rain was about normal and the total amount was about 30 per cent. in excess of normal. The heaviest rain occurred on the 28th and 29th, exceeding two inches.

No destructive storms have visited Iowa; tornadoes are yet restricted to southern states. The cold, high winds from the 6th to the 9th were succeeded by a spell of remarkably fine weather, lasting till the 16th.

The continued cold weather left the ground cold till into the third decade, and must be the main cause of the failure of much of the corn planted before the 25th.

The spring season now closed has been about two degrees below the normal and vegetation is accordingly very backward.

For the first time since the white race inhabits this valley have we had three consecutive severe winters. We now can see not only additional gaps in our orchards, but even the Concord grape-vine is almost killed.

The normal cold spells of May were severe, but set in extraordinarily early, namely, four days in advance of the normal date. Vegetation being very backward, no harm could be done to fruit buds.

The following extract is from the May, 1885, report of the "Louisiana Weather Service," under direction of Mr. Robert S. Day, New Orleans:

The mean temperature for the month of May was 1° below that for the same month last year, but the extremes were slightly greater. From the 1st to the 15th it was cooler and the rest of the month warmer than usual. Two cold waves crossed the state on the 3d and 5th, and on the 9th and 11th, the former being quite severe, but doing no damage to crops.

The rainfall was quite evenly distributed, and about one-half the quantity of last year's average.

No excessive weather is reported, and all farm work has progressed uninterruptedly.

The following meteorological summary and accompanying remarks are from the May, 1885, report of the "Indiana Volunteer Weather Service," under direction of Professor W. H. Ragan, of De Pauw University, Greencastle:

Districts.	Temperature.			Precipitation.
	Highest.	Lowest.	Monthly mean.	
Northern counties.....	88	24	57.4	4.80
Central counties.....	90	24	59.9	2.90
Southern counties.....	90	32	62.9	3.65
State.....	90	24	60.1	3.78

The weather conditions of the state were dominated by a high barometer on the 3d, 15th, 16th, 19th, and by a low on the 1st, 5th, 6th, 7th, 8th, 9th, 17th, 18th, 28th, 29th, 30th. And on the 2d, 4th, 10th, 11th, 12th, 13th, 14th, 20th, 21st, 22d, 23d, 24th, 25th, 26th, 27th, 31st, neither cyclonic nor anti-cyclonic forces were present in an important degree.

The temperature seems to have ranged from one to four degrees below the normal at various stations. The highest temperatures occurred at most stations on the 24th, in connection with a low barometer central, that morning, north of the lakes, and a high barometer central off the middle Atlantic coast. The lowest temperatures occurred mostly on the 3d, 8th, and 10th, in connection with high barometers central, on the 3d, in the middle Mississippi valley, on the 8th, north of Montana, and on the 10th, north of Dakota. There was a low central over the Gulf of Saint Lawrence on the 3d, one central north of Lake Superior on the 8th, and north of New York on the 10th.

The rainfall was tolerably evenly distributed through the month and over the state. The number of stations reporting and the aggregate precipitation on the various days of the month follows, in the order of date, number of stations, aggregate precipitation: 1st, 16, 1.53; 2d, 2, 0.12; 3d, 25, 2.06; 4th, 3, 1.00; 5th, 19, 4.57; 6th, 31, 23.31; 7th, 7, 0.54; 8th, 7, 0.82; 9th, 13, 0.74; 10th, 4, 0.03; 12th, 24, 0.68; 13th, 11, 0.20; 18th, 10, 0.67; 19th, 9, 0.60; 21st, 28, 7.83; 22d, 25, 11.47; 23d, 11, 3.35; 24th, 27, 11.60; 25th, 13, 4.10; 26th, 3, 0.02; 27th, 19, 4.25; 28th, 24, 11.67; 29th, 29, 18.21; 30th, 28, 10.32; 31st, 3, 0.02; none, 11th, 14th, 15th, 16th, 17th, 20th. Thunder-storms were general on the 5th, 6th, 18th, 21st, 22d, 23d, 24th, 29th, 30th. The heaviest rains occurred on the 6th, in connection with a low barometer central, that morning, in the middle Mississippi valley, and on the 29th, with low central, in a. m., in Iowa. A well-marked storm-centre crossed the state on the 30th. The barometer gradients around it were not steep, and no great force was developed. Snow fell at Miami and Wabash on the 8th. Frosts are reported from central and southwestern stations on the 2d, 3d, 8th, 10th, 11th.

Examination of the records in our possession discovers no steady correspondence between the temperature of April and succeeding May, or winter and succeeding spring. It seems, however, to be a pretty well established rule that if the departure from the normal, above or below, is very great, for any limited period, the departure for the succeeding like period is apt to be in the same

direction. As an illustration we have, at Logansport, winter 1870-1, 5°.7 above, spring 4° 8 above; winter 1866-7, 6° 3 below, spring 6° 7 below; at Spiceland, 1877-8, 7° 0 above, 4° 8 above; 1884-5, 7° 0 below, 2° 5 below; Vevay, 1879-80, 8° 5 above, 4° 4 above; 1872-3, 5° 0 below, 1° 2 below. At Logansport, warmest spring, 1860, coldest, 1857; Spiceland, 1871, 1857; Indianapolis, 1878, 1885; Vevay, 1871, 1869. Greatest and least precipitation: Spiceland, 1862, 1870; Indianapolis, 1880, 1872; Vevay, 1865, 1879.

Total wind velocity; Lafayette, 5,920 miles; Indianapolis, 4,101; Greencastle, 5,253.

The following is an extract from the May, 1885, report of the "Minnesota Weather Service," under direction of Prof. W. W. Payne, of Carleton College, Northfield:

The mean temperature of May, in Minnesota, has been slightly below the normal for nearly all portions of the state, the differences amounting to -1° 7 at Duluth, -0° 6 at Moorhead, -2° 5 at LaCrosse, and -1° 6 at Saint Paul. The temperature from the 1st to 5th was mild in all sections. During the night of the 4-5th, there was a remarkable fall in temperature, amounting at most stations to 25°, ushering in a cold term which lasted until the 10th. High winds, light snows, frost and ice occurred during the continuance of this cold term, but because of the backwardness of the spring, little damage was done to vegetation except to delay its progress. The minimum temperatures for the month were reported at nearly all the stations on the morning of the 7th. The temperatures at Saint Paul, 26° 6, and LaCrosse, 29° 5, on that date, were the lowest since 1875. After the 10th, the temperature became gradually warmer, and vegetation made rapid progress. The last frosts occurred on the 18th and 19th; that of the latter date was severe in the southeast part of the state, causing damage to early vegetables and fruit at Rochester and La Crosse. Southerly winds prevailed from the 20th to the 23d, with a rapid rise in temperature which culminated on the 23d, when the highest mean and maximum temperatures for the month were observed. From the 24th to the end of the month, the weather was mild and equable.

The fluctuations of the barometer were not marked for May, the highest readings were on the 2d, and lowest on the 4-6th, and 15th. The highest reading was 30.257 at Bird Island on the 2d, and lowest 29.443 at Moorhead on the 15th.

There was a marked deficiency in the rainfall for May, throughout the state, with the exception of the extreme northwest in the Red River valley, where an excess is complained of. This deficiency was greatest in the central western part of the state where it amounted to from 3 to 3.6 inches. One station, Bird Island, reported only 0.44 inch for the month. In other parts of the state the deficiencies ranged from 1.2 to 3 inches. The 6th, 7th, 16th, 17th, 20th, 21st 23d, 24th and 30th, were the dates of the greatest precipitation, showing the rain to have been well distributed, and thus while deficient in amount, yet of great benefit to vegetation.

Precipitations of .50 of an inch or over were observed as follows: Moorhead 1.18 on 15th, and .92 on 23d; Duluth, .54 on 6th; Saint Paul, .86 on 17th; La Crosse, 1.02 on 17th, .84 on 24th; Park Rapids, .59 on 24th; Wadena, .90 on 21st, .60 on 23d; Hastings, .92 on 6th, .53 on 16th; Redwing, .74 on 17th; Dodge Centre, 1.15 on 20th, .52 on 24th; Northfield, .70 on 17th, .85 on 24th.

The 30th was notable for the number of thunder storms and light rains which occurred on that date.

The following is the May, 1885, report of the "Missouri Weather Service," under the direction of Prof. Francis E. Nipher, Saint Louis:

The mean temperature during the past month has been somewhat below the normal for May. At the central station it was 63° 7, which is 2° 6 below the normal for Saint Louis. The highest temperatures during the month were observed in the first part of the third decade, generally on the 24th. At Saint Louis the maximum reached was as high as 90° 3.

The lowest temperatures were observed in the latter part of the first decade. The cold winds from the northwest on the 5th and 6th lowered the temperature 15° to 25° over the whole state in from twenty-four to thirty-six hours. The greatest change was at Savannah, 29°.

On the 8th there was white frost in several parts of the state, on the 7th and 10th white frost was also observed in some few localities.

The records show the following observations: Greenfield, on the 8th, 9th, 10th, 15th; Graham, 7th, 8th, 9th; Chamois, 8th, 9th, 10th, all tender vegetation killed on the morning of the 10th; Kirksville, on the morning of the 7th, strawberry foliage frozen, but fruit not damaged; Protom, 8th, 9th, 10th, garden vegetation seriously injured on the uplands; Mexico, 8th, 9th; Hannibal, ground frozen in enclosed space on the 7th; Ironton, 10th, 11th; Lexington, frosts on the 1st, 9th, 10th, 11th; thin ice on the morning of the 8th; Miami, 8th, 9th, 10th, 11th; Glasgow, 8th, 10th; Oregon, 2d, 7th, 8th, 9th, 10th, no injury done to fruits on account of dry atmosphere; Keokuk, 7th, 10th.

The precipitation has been pretty evenly distributed all over the state, the heaviest being in southwestern parts. The greater portion of the rainfall was in the latter part of the month. The rainstorm of the night of the 27th did a great deal of damage to crops and property in the neighborhood of Steelville.

Snow was observed in different parts of the state on the 6th and 7th (Greenfield 7th); Ironton, snow and sleet on 7th.

Notes.—Chamois, wheat brought out somewhat by the rains in latter part of the month, but will not make more than one-fourth of an average crop. Corn small and uneven, owing to bad weather and poor seed.

Kirksville, crops backward.

Protom, corn late and small; cotton good and promising; wheat will be light.

Houstonia, outlook for winter wheat poor; a great deal plowed up and put in corn; spring wheat good, corn very poor; cold, wet weather and poor seed the cause.

Glasgow, strawberries fine and plentiful, good crops of small fruits.

Rainfall record at Saint Charles incomplete.

The corn-crop is generally backward and poor, due to the cool and wet weather, and wheat prospects very poor.

The following is an extract from the May, 1885, report of the "Nebraska Weather Service," under direction of Professor Goodwin D. Swezey of Doane College, Crete:

The temperature for the month of May has been below the average by about four degrees. In 1882 the month was two degrees cooler than this, but in all other years since 1879 it has been warmer. But one considerable cold wave passed over Nebraska which was on the 6th and 7th, the thermometer falling about twenty degrees. This cold wave came from the northwest, appearing in Dakota on the 5th and disappearing off Florida on the 9th.

Three general storms have swept across the country during the month, bringing rain to Nebraska and passing eastward chiefly over the lake regions; these were about the 5th, 15th and 29th; the first and last were here accompanied by slight rains, the second by the heaviest rains of the month. Local rains also fell on various other dates, amounting in all to about 4.39 inches, which is about the normal rainfall for May.

The wind record for the month has been low; so has also the record of hail and thunder-storms.

The average of rain for the different sections of the state for May, 1885, is as follows: northeast section, 4.48 inches; southeast section, 4.84; northwest section, 3.43; southwest section, 3.68; greatest number of days of appreciable precipitation, 12, at York.

The following is an extract from the May, 1885, bulletin of the "New England Meteorological Society," under direction of Prof. Winslow Upton, Providence, R. I.:

The following discussion of the meteorological conditions for the month is based upon reports from one hundred and ten observers, and upon the current publications of the United States Signal Service:

General Conditions.—The month was generally cool, with frequent light rains and only a few high winds. The conditions were favorable to vegetation, frosts having been few and mostly confined to the early days of the month. A marked peculiarity of the month was the almost total absence of thunder-storms.

Precipitation.—The rainfall was generally less than the average, though a few stations report an excess. At the majority of stations the amount was distributed through the month with approximate regularity, the rains occurring at intervals of four or five days. The deficiency at the summit of Mount Washington was very marked, the amount being the smallest on record at that station in May. The variation in the rainfall at Mount Washington, however, is quite large, as shown by comparing the records of the same month in different years. During the fourteen years of observation, the precipitation in May has ranged from 2.29 inches, in 1885, to 12.50 inches in 1881. But few instances of heavy rains were reported. Snow fell at a few stations in the northern portion of the district in the storm of the 1st and 2d. Hail fell at Williamstown, Massachusetts, on the 10th and 31st.

Temperature.—The mean temperature of the month was in general below the average, but from comparison with records for previous years at the different stations the results are quite discordant, not a few observers reporting an excess. There were no extremes of cold and but few days of unusually high temperature. Readings above 90° were recorded at four stations on the 19th.

Pressure.—The barometric pressure showed a small range. Thus, at Gardiner, Maine, the highest and lowest readings (reduced to sea-level) were 30.29 and 29.50; at Blue Hill, 30.30 and 29.53, and Albany, New York, 30.27 and 29.60 respectively. Five barometric depressions passed sufficiently near the district to affect the meteorological conditions. The first advanced from the southwest and was central at Cape Cod on the 2d. It was accompanied by general rain and violent winds. The second was a light depression on the Carolina coast on the 7th, which was attended by rain in the southern portion. The third advanced down the Saint Lawrence valley on the 10th, the rains being general. The fourth moved up the Atlantic coast on the 14th and 15th, wholly beyond the coast-line, but causing general rain and high winds on the coast. The fifth moved from the lake region eastward to Maine on the 18th and 19th, and was attended by general rains. The sixth was a depression moving from the lake region eastward to Nova Scotia as the month closed. The rain connected with this depression was general, and is partly included in May and partly in June. Local rains, especially in the northern portion of the district, occurred in connection with the area of high pressure which followed the fifth depression mentioned above.

Winds.—The winds were light, except in connection with the first and fourth depressions mentioned above. The highest hourly velocities reported were: 2d, Eastport, Maine, 41 miles; Blue Hill, 48 miles; Mount Washington, 98 miles; 14th, Boston, 44 miles; Block Island, 52 miles. The total wind movement for the month at Boston was 7,811 miles, Blue Hill, 11,840 miles, Mount Washington, 18,040 miles. The last named is 4,117 miles less than the May average.

Thunder-storms.—No general thunder-storm was observed in New England. In connection with the rain of the 19th, thunder and lightning were noted at

Burlington, Charlotte, Chelsea, Lunenburg, and Strafford, Vermont, (6.30 p. m.,) and Saint John, N. B. On the 9th thunder was noted at Littleton, New Hampshire, Chelsea and Lunenburg, Vermont. On the 27th a thunderstorm occurred at Eastport, Maine. Distant lightning, with no thunder, was noted at Setauket, Long Island, on the 4th, 8.30 p. m., in the south; and at Providence, Rhode Island, on the 25th, at 9 p. m., in the southwest. On the 25th, 5.30 p. m., thunder was heard at Norfolk, Connecticut, a heavy cloud passing north of the town, moving from west to east.

Advance of the Season.—The late opening of the spring noted in the April Bulletin was followed by a steady growth, so that at the close of May vegetation seems to be as far advanced as usual. At Fitchburg, Massachusetts, the dates of apple-blossoming in the twenty-nine years of the record range between May 13 and June 5, averaging May 24; this year the date is May 25. At Bridgeton, Maine, the dates of cherry-blossoming in the eight years of the record range between May 9 and June 24, averaging May 21, which is the date this year.

The following summary for May, 1885, is from an advance report of the "Ohio Meteorological Bureau," under direction of Professor T. C. Mendenhall:

Atmospheric pressure.—Mean for the state (observations at twenty-one stations), 29.91 inches; highest monthly mean, 29.96 inches at Dayton, Montgomery county; lowest monthly mean, 29.73 inches at Portsmouth, Scioto county; greatest monthly barometric range, 0.75 inch at Ironton, Laurence county, and Canton, Stark county; least monthly barometric range, 0.63 inch at College Hill, Hamilton county.

Temperature.—Mean for the state (observations at thirty-three stations), 56°.1; highest monthly mean, 63°.3, at Waverly, Pike county; lowest monthly mean, 55°.6, Cleveland; Maximum, 91°, at Portsmouth, Scioto county, on the 5th; minimum, 21°, at Wauseon, Fulton county, on the 3d; monthly range for the state, 70°; station reporting largest monthly range, Wauseon, 62°.3; station reporting least monthly range, Hiram, Portage county, 47°.

Precipitation.—Average for state, (observations at thirty-three stations), 4.06 inches; largest monthly, 5.92, at Ohio State University; smallest monthly, 1.78 at College Hill.

The following is an extract from the report of the Tennessee Weather Service, for May, 1885, under direction of Hon. A. J. McWhirter, commissioner:

There were no special meteorological features for May except the continued daily rainfall during the ten days ending on the 30th.

A cold wave appeared on the 8th in the western portion of the state, and on the succeeding day in the middle and eastern portions, causing a fall of tem-

perature of from ten to twenty degrees. This continued until the 11th and was accompanied by frosts of greater or less severity, those of the 10th and 11th doing some damage in a few localities to young corn and cotton, and to tender vegetables.

The mean temperature for the month was 64°.53, 1°.89 below the mean of last May, and about the same as that of May, 1883. The mean of maximum temperatures was 86°.25, and that of the minimum temperatures 41°.63; the former 1°.25 above, and the latter 6°.37 below, the respective means of last year, showing a greater range. The highest temperature was recorded about the 18th, 23d and 24th, and the lowest about the 10th and 11th.

The average rainfall was 4.27 inches, 1.52 inches greater than the average for the month of April (which, by the way, was abnormally low), and 0.69 inch greater than the average for the corresponding period last year. A large proportion of this was received by the eastern half of the state, while in the western portion the fall was very light. The eastern division received an average of 5.64 inches, the middle division an average of 4.55 inches, and the western division an average of only 2.62 inches. The greatest rainfall was 7.99 inches, reported at Beech Grove, and the least was 1.49 inches reported at Covington, near the western boundary. The greatest daily rainfall was 3.20 inches, reported at Pulaski on the 27th. The days of the greatest rainfall were the 6th, 19th, 26th and 27th, and were all general rains. The first named was the greatest of the month, the fall amounting to an average of 0.94 inch for the state. The rains from the 19th to the 30th, inclusive, were general rains and were heaviest in the middle division. The 2d, 3d, 4th, 9th, 10th, 14th, 15th, 16th and 17th were reported rainless days.

SUMMARY.

Temperature.—mean, 64°.53, highest, 94°, on the 24th, at Hohenwald and Somerville; lowest, 33°, on the 10th, at Kingston Springs; range 61°; mean monthly range 44°.83; greatest monthly range 60°, at Hohenwald; least least monthly range, 35°, at Howell and Florence station; mean daily range, 16°.74; greatest daily range, 42°, on the 4th, at Kingston Springs; least daily range, 2°, on the 2d, at Dickson, on the 7th at McKenzie, on the 21st, at Hardison's Mills, on the 26th, at Paris, and on the 30th, at Austin; mean of maxima, 86°.25; mean of minima, 41°.63.

Rainfall.—mean depth, 4.27 inches; mean daily, 0.138 inch; greatest, 7.99 inches, at Beech Grove; least, 1.49 inches, at Covington; greatest local daily, 3.20 inches, on the 27th, at Pulaski; days of greatest, 6th, 19th, 26th, 27th; day of greatest, 6th.

Average number of days on which rain fell, 10.2; of clear days, 10.5; of fair days, 9.8; of cloudy days, 10.7:

Coldest days, 10th, 11th.

Warmest days, 18th, 23d, 24th.

Prevailing winds, south and southwest.